

I Claim:

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1. A method of treating a heart to remodel gap junctions, comprising contacting linked multiple electrode pairs to an epicardial surface of a heart, and connecting the electrode pairs to a pacemaker to apply periodic electrical signals to the epicardial surface through said electrode pairs, said signals being applied for a sufficient time and having characteristics sufficient to remodel gap junctions in the heart.

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2. The method according to claim 1, wherein the step of contacting comprises contacting a strip electrode material having linked multiple electrode pairs mounted thereon.

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3. The method according to claim 2, wherein the strip electrode material comprises a strip of medical grade polyurethane.

4. The method according to claim 3, wherein the strip is about 7cm x 1cm in dimension.

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5. The method according to claim 1, wherein the step of contacting comprises contacting linked multiple electrode pairs to an epicardial surface of a heart, wherein the linked multiple electrode pairs are arranged in two columns with one

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electrode in each pair in one column, and the other electrode in each pair in the other column.

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6. The method according to claim 5, wherein each electrode in the electrode pair is about 2mm from each other, and wherein each electrode pair is about 5mm from its closest electrode pair.

7. The method according to claim 1, wherein the electrodes comprise platinum.

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8. The method according to claim 7, wherein the electrodes consist essentially of unalloyed platinum.

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9. The method according to claim 1, wherein the step of contacting comprises sewing a substrate strip containing linked multiple electrode pairs to an epicardial surface of the heart.

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10. The method according to claim 1, wherein the step of contacting comprises locating a transvenous catheter containing linked multiple electrode pairs into an epicardial vein.

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11. The method according to claim 1, wherein the step of contacting comprises placing electrodes into heart ventricles

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for endocardial activation.

5 12. A device for treating a heart to obtain gap junctional remodeling, comprising a substrate having linked multiple electrode pairs for contacting an epicardial surface of a heart and for delivering periodic pacemaker electrical signals to the epicardial surface through said electrode pairs, to remodel gap junctions in the heart.

10 13. The device according to claim 12, further comprising a strip of electrode material having mounted thereon the linked multiple electrode pairs.

15 14. The device according to claim 13, wherein the electrode material comprises medical grade polyurethane.

20 15. The device according to claim 12, wherein the electrode pairs are arranged in two columns with one electrode in each pair in one column, and the other electrode in each pair in the other column.

16. The device according to claim 15, wherein one electrode in the pair is about 2mm from the other electrode in the pair, and wherein each electrode pair is about 5mm from its closest

electrode pair.

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17. The device according to claim 12, wherein the electrodes are comprised of platinum.

18. The device according to claim 17, wherein the electrodes consist essentially of unalloyed platinum.

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19. The device according to claim 12, wherein each electrode is connected to an insulated stainless steel wire.

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20. A method of treating a heart to alter the effective refractory period, comprising contacting linked multiple electrode pairs to an epicardial surface of a heart, and connecting the electrode pairs to a pacemaker to apply electrical signals to the epicardial surface, said signals being applied for a sufficient time and having characteristics sufficient to alter the effective refractory period of the heart.

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21. The method according to claim 20, wherein the step of contacting comprises contacting a strip electrode material having linked multiple electrode pairs mounted thereon.

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22. The method according to claim 21, wherein the strip electrode material comprises a strip of medical grade polyurethane.

5 23. The method according to claim 22, wherein the strip is about 7cm x 1cm in dimension.

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10 24. The method according to claim 20, wherein the step of contacting comprises contacting linked multiple electrode pairs to an epicardial surface of a heart, wherein the linked multiple electrode pairs are arranged in two columns with one electrode in each pair in one column, and the other electrode in each pair in the other column.

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25. The method according to claim 24, wherein each electrode in the electrode pair is about 2mm from each other, and wherein each electrode pair is about 5mm from its closest electrode pair.

20 26. The method according to claim 20, wherein the electrodes comprise platinum.

27. The method according to claim 26, wherein the electrodes consist essentially of unalloyed platinum.

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28. The method according to claim 20, wherein the step of contacting comprises sewing a substrate strip containing linked multiple electrode pairs to an epicardial surface of the heart.

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29. The method according to claim 20, wherein the step of contacting comprises locating a transvenous catheter containing linked multiple electrode pairs into an epicardial vein.

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30. The method according to claim 20, wherein the step of contacting comprises placing electrodes into heart ventricles for endocardial activation.

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31. A device for treating a heart to alter the effective refractory period, comprising a substrate having linked multiple electrode pairs for contacting an epicardial surface of a heart and for delivering periodic pacemaker electrical signals to the epicardial surface through said electrode pairs, to alter the effective refractory period in the heart.

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32. The device according to claim 31, further comprising a strip of electrode material having mounted thereon the linked multiple electrode pairs.

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33. The device according to claim 32, wherein the electrode material comprises medical grade polyurethane.

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34. The device according to claim 31, wherein the at least two electrode pairs are arranged in two columns with one electrode in each pair in one column, and the other electrode in each pair in the other column.

10 35. The device according to claim 34, wherein one electrode in the pair is about 2mm from the other electrode in the pair, and wherein each electrode pair is about 5mm from its closest electrode pair.

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36. The device according to claim 31, wherein the electrodes are comprised of platinum.

37. The device according to claim 36, wherein the electrodes consist essentially of unalloyed platinum.

20 38. The device according to claim 31, wherein each electrode is connected to an insulated stainless steel wire.

39. A method of treating a heart to induce ion channel remodeling, comprising contacting linked multiple electrode pairs to an epicardial surface of a heart, and connecting the electrode pairs to a pacemaker to apply periodic electrical signals to the epicardial surface, said signals being applied for a sufficient time and having characteristics sufficient to induce ion channel remodeling in the heart.

40. The method according to claim 39, wherein the step of contacting comprises contacting a strip electrode material having linked multiple electrode pairs mounted thereon.

41. The method according to claim 40, wherein the strip electrode material comprises a strip of medical grade polyurethane.

42. The method according to claim 41, wherein the strip is about 7cm x 1cm in dimension.

43. The method according to claim 39, wherein the step of contacting comprises contacting linked multiple electrode pairs to an epicardial surface of a heart, wherein the linked multiple electrode pairs are arranged in two columns with one electrode in each pair in one column, and the other electrode in each pair in the other column.

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44. The method according to claim 43, wherein each electrode in the electrode pair is about 2mm from each other, and wherein each electrode pair is about 5mm from its closest electrode pair.

45. The method according to claim 39, wherein the electrodes comprise platinum.

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46. The method according to claim 45, wherein the electrodes consist essentially of unalloyed platinum.

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47. The method according to claim 39, wherein the step of contacting comprises sewing a substrate strip containing linked multiple electrode pairs to an epicardial surface of the heart.

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48. The method according to claim 39, wherein the step of contacting comprises locating a transvenous catheter containing linked multiple electrode pairs into an epicardial vein.

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49. The method according to claim 39, wherein the step of contacting comprises placing electrodes into heart ventricles

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for endocardial activation.

5 A device for treating a heart to induce ion channel remodeling, comprising a substrate having linked multiple electrode pairs for contacting an epicardial surface of a heart and for delivering periodic pacemaker electrical signals to the epicardial surface through said electrode pairs, to induce ion channel remodeling in the heart.

10 51. The device according to claim 50, further comprising a strip of electrode material having mounted thereon the linked multiple electrode pairs.

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15 52. The device according to claim 51, wherein the electrode material comprises medical grade polyurethane.

53. The device according to claim 50, wherein the electrode pairs are arranged in two columns with one electrode in each pair in one column, and the other electrode in each pair in the other column.

20 54. The device according to claim 53, wherein one electrode in the pair is about 2mm from the other electrode in the pair, and wherein each electrode pair is about 5mm from its closest electrode pair.

55. The device according to claim 50, wherein the electrodes are comprised of platinum.

56. The device according to claim 55, wherein the electrodes consist essentially of unalloyed platinum.

57. The device according to claim 50, wherein each electrode is connected to an insulated stainless steel wire.

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